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SUCCESS IN FIRST GRADE READING

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Arthur V. Olson
Sylvia R. Gavel
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Every child should find success in school. The self-disciplines of learning are difficult to establish unless the child feels that he is making constant progress. Learning to read is the major task which confronts the first grade child. The more we can learn about the early processes of reading, the better start we can give the child toward the use of the rich resources of the printed word.

The present report consists of four doctorate studies related to a research project at Boston University conducted under a grant from the Warren Benevolent Fund.

THE AUTHORS

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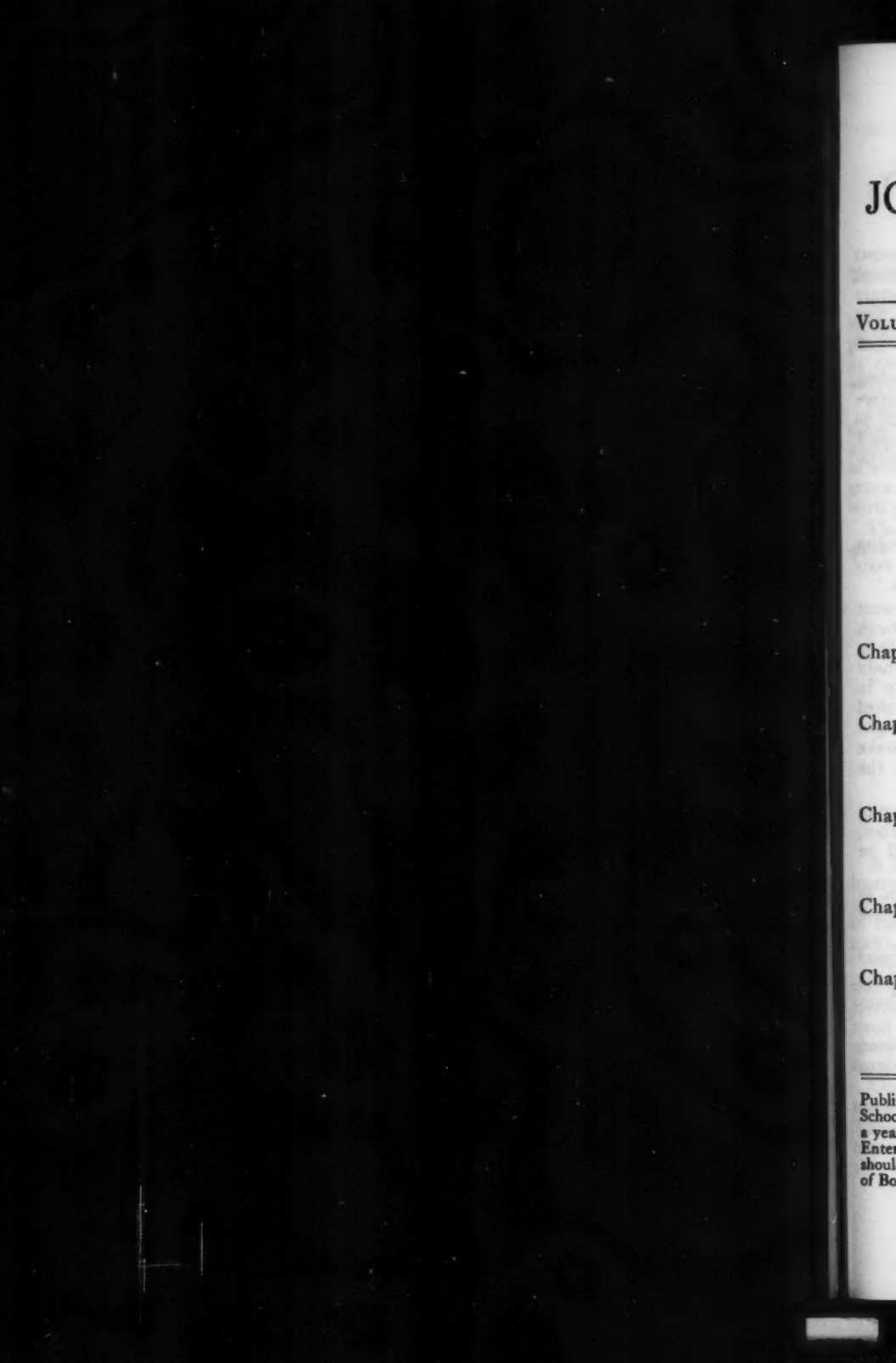

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Chapter I

FIRST-GRADE READING SUCCESS STUDY: A SUMMARY

DONALD D. DURRELL

The proper concern of professional education is to assure competent service to children, service which produces high achievement and eliminates unnecessary failure. Success in initial classroom instruction is more important than providing remedy after failure. This is particularly true in learning to read, since reading is an essential basis for later school achievement.

After twenty-five years of clinical service and research related to reading instruction, it seemed desirable to the language arts staff of Boston University to conduct a large-scale study which employed practices indicated as desirable by research and clinical experience. A grant was obtained which made possible a cooperative study which involved more than 2,000 first-grade children.

Purposes of the Study

The purposes of the study were three: to assure reading success among the first-grade children; to evaluate reading readiness practices and concepts; to study relationships among various aspects of reading growth.

Clinical services indicated that reading failures at first-grade level were usually overcome when the following abilities were established through effective teaching: knowledge of letter names, ability to identify sounds in spoken words, knowledge of applied phonics. Additional services commonly needed were meaningful word recognition practice and special help in beginning silent reading. It appeared that if these needs were identified and served in initial classroom instruction, much reading difficulty might be prevented. In addition, it was hoped that rapid learners might make higher achievement if unnecessary instruction were eliminated from the reading program.

Reading readiness practices and concepts are still in controversy despite research evidence on several factors. By applying measures in September, November, February, and June, answers to many questions should be obtained.

1. What are the differences among beginning first-grade children in different levels of letter knowledge, in ability to identify separate sounds in words?
2. What is the relationship between these abilities and reading success?
3. Does early systematic instruction in letter names and sounds produce higher reading achievement than incidental instruction in them throughout the year?

A number of assumptions relating to beginning reading have gained current acceptance without clear evidence of their merit. Analysis of data from this study should shed light on the following:

1. Will raising entrance age diminish reading failures? Do children who meet only minimum entrance age requirements bring poorer backgrounds to first grade than children who are older?

2. Does a mental age of six assure reading success, lower mental ages indicate failure? Is there an optimum mental age for beginning reading?
3. Should a "sight vocabulary of 75 words" be established before word analysis skills are taught? Can a sight vocabulary be established without a background of word analysis?

The Service Program

After conferences with administrators and supervisors of four Greater Boston communities, meetings were held with first-grade teachers. The program was explained and teachers invited to participate. All 91 teachers in the four communities, serving more than 2,300 children indicated willingness to take part.

During the third week of September, tests were administered in all of the classrooms. The tests dealt with several levels of letter knowledge, the ability to identify separate sounds in spoken words, visual discrimination of words, learning rate in word recognition, and a group measure of intelligence. The tests were scored immediately and the teachers were provided with profiles of scores of individual pupils.

The following program was suggested at meetings of teachers during the week after the testing:

1. Children high in learning rate, in letter names, and in hearing sounds in words were grouped together. For them, reading instruction was started at once; both word recognition and applied phonics were presented immediately. The reading readiness program of the basal reading system was skipped.
2. Children lower in learning rate and with gaps in letter and sounds-in-words knowledge were grouped together. Although some sight vocabulary was taught, the main emphasis was on systematic instruction in letter names and on the ability to identify sounds in words. This was followed later by instruction in applied phonics.
3. Children who were low in learning rate and in letter and sounds-in-words knowledge were grouped together. These, too, started some sight vocabulary learning, but the major emphasis was on letter names and identifying separate sounds in spoken words.

A more complete description of the techniques used in the program of instruction in letter names, sounds, and applied phonics is found in Chapter 5. Most of the teaching of letters and sounds was done with whole words in meaningful situations, but there was no prohibition of learning letters and sounds apart from words.

Word recognition in the stories of the basal readers (Scott, Foresman) was provided from the beginning, but at a slower pace for the slower learners. Systematic review of sight vocabulary was given which emphasized response to word meaning rather than to the name of the word; special practice in silent reading was given through the use of sentence flash cards.

One of the major handicaps to the instructional program was the necessity for teachers to build and exchange much of the instructional materials. The materials supplied with the basal readers and certain other published materials were used when suitable, but the largest share of supplementary

exercises were teacher built. One of the main services of the local reading supervisors was the duplication and exchange of this type of material. In the one community in which this was not done, the results were much less favorable.

The Controlled Study

Since a general application of the methods to all classrooms would permit no comparisons of achievement except with norms on standard tests, a controlled study was planned. This consisted of pairing twelve experimental classrooms with twelve control classrooms in the same schools. Both groups used the same basal reading system but experimental instruction emphasized early teaching of letter names and sounds, while the control group followed the basal system practice of giving such instruction incidentally throughout the year. The findings in this study are reported in Chapter 5.

The Testing Program

Tests of various aspects of reading achievement were given at four periods during the year: the third week of September, the second week of November, the first week of February, and the first week of June. It must be acknowledged that such a detailed testing program was a part of the instructional motivation; the knowledge that pupils are to be tested for specific abilities will direct special teacher attention to them.

Both group and individual tests were given in September and February; group tests only were given in November and June, except in the controlled study where individual tests were given in June. The September tests were typical of the tests given throughout the year:

Group tests:
- Otis Quick-Scoring Mental Ability Tests; Alpha.
- Murphy-Durrell Diagnostic Reading Readiness Test, including:
  - Ability to identify sounds in words.
  - Ability to identify lower-case letters shown.
  - Ability to identify words shown.
  - Learning rate for 10 words (tested individually).
- Tests of levels of letter knowledge, both capital and lower case:
  - Ability to match letters.
  - Ability to identify letters shown.
  - Ability to identify letters named.
  - Ability to write letters.

Individual tests:
- Ability to give names of letters.
- Ability to give sounds of letters.

Several of these tests were dropped from the battery when distribution of scores on earlier tests showed that they were too easy for later testing periods. Tests were added as abilities developed. Some of these were tests of identifying sounds in words, applied phonics, oral reading inventory tests, word classification tests, and other measures suited to the advancing levels of ability. A more complete listing and description of tests will be found in later chapters.

Findings

Later chapters in this report present the statistical findings at the various testing periods. A summary of the major findings and their implications follows:

1. Most reading difficulties can be prevented by an instructional program which provides early instruction in letter names and sounds, followed by applied phonics and accompanied by suitable practice in meaningful sight vocabulary and aids to attentive silent reading. Among the 1,500 children measured in June, only 18 had a sight vocabulary of less than 50 words; this is slightly more than 1 per cent of the population. Four per cent, or 62 children, had a sight vocabulary of less than 100 words. (Chapter 4)
2. Early instruction in letter names and sounds produces a higher June reading achievement than does such instruction given incidentally during the year. (Chapter 5)
3. Children with high learning rates and superior background skills make greater progress when conventional reading readiness materials are omitted from their reading programs. (Chapter 4)
4. Children entering first grade present wide differences in levels of letter knowledge:
   a. All children were able to match capital letters as well as lower-case letters. Exercises in this ability should be omitted from reading readiness materials. It appears to follow that matching of nonword forms and pictures as preliminary instruction for letter and word perception is relatively useless. (Chapter 2)
   b. The average child in this population of first-grade children could, in September: give the names of 12 capital letters and 9 lower-case letters; identify 17 capitals named and 12 lower-case letters named; write 10 letters from dictation. (Chapter 2)
5. Tests of knowledge of letter names at school entrance are the best predictors of February and June reading achievement. (Chapters 3 and 4) They relate most closely to learning rate in September. (Chapter 2)
6. Chronological age shows little relationship to any of the factors measured at any testing period. It correlates negatively with reading achievement. (Chapters 3 and 4) Even mental age responds only slightly to chronological age differences in first grade. A difference of nine months of chronological age produces a difference of only three months of mental age. (Chapter 2) Apparently no solution to reading difficulties is to be found by raising the entrance age to first grade.
7. Mental age, as measured by the Otis Quick-Scoring Tests of Mental Ability, has a low relationship to reading achievement and to letter and word perception skills. (Chapters 2, 3, and 4)
8. There appears to be no basis for the assumption that a sight vocabulary of 75 words should be taught before word analysis skills are presented. Of the 1,170 children tested in February, only 9 achieved a sight vocabulary of more than 70 words when they knew fewer than 20 letters. Of the children who knew more than 20 letters, 675 had a sight vocabulary of more than 70 words. While a knowledge of letter

names and sounds does not assure success in acquiring a sight vocabulary, lack of that knowledge produces failure. (Chapter 3)

Acknowledgments

The editor wishes to acknowledge especially the assistance of Professors Helen A. Murphy and B. Alice Crossley, of the faculty of Boston University who were associated with him in the planning and supervision of this study. The Warren Benevolent Fund supplied a research grant to finance the project. The excellent cooperation of teachers and administrators in the four Massachusetts communities which took part in the study—Natick, Newton, Wakefield, and Waltham—is gratefully acknowledged. The success of the study is due in a large measure to the local supervisors, Marjorie Follansbee, Eleanor Linehan, and Katherine Morrill.

Chapter II

BACKGROUND ABILITIES RELATED TO READING SUCCESS IN FIRST GRADE

ALICE NICHOLSON

The purpose of this study was to make an extensive and precise inventory of certain visual, auditory, and kinesthetic abilities in relation to letters and words, to learn the retention capacities for sight words, and to relate these abilities to chronological age, mental age, and sex of first-grade entrants.

Specifically, the investigation was concerned with the following:

1. The ability of first-grade entrants
   a. To match capital and lower-case letters directly.
   b. To identify capital and lower-case letters following a flash stimulus.
   c. To identify capital and lower-case letters named by the examiner.
   d. To write letters dictated, either in capital or lower-case form.
   e. To give the names of capital and lower-case letters.
   f. To give the sounds of capital and lower-case letters.
   g. To identify separate sounds in spoken words.
   h. To identify words from a flash stimulus.
   i. To write own name.
   j. To learn and retain learning of sight words.
2. The relationship of the various letter knowledges to
   a. Mental age.
   b. Chronological age.
   c. Learning rate.
   d. Sex differences.

In order to get this information, the following tests were given:

Boston University Letter Knowledge Tests. (Informal tests)

Murphy-Durrell Diagnostic Reading Readiness Test. (World Book Co., 1949)

Otis Quick-Scoring Mental Ability Tests: Alpha. (World Book Co., 1953)

California Mental Maturity Test. (California Test Bureau, 1950)

The test descriptions are presented with the distribution of scores in the following section on analysis of data.

The tests were administered to more than two thousand children in four communities within a twenty-mile radius of Boston. The largest sample was an industrial city; the others were suburban communities somewhat above average in economic status.

TABLE I

Community	*Number of Classes*	*Number of Pupils*
1	21	664
2	17	449
3	13	417
4	30	809
Totals	91	2,339

Three of the communities had kindergartens. The minimum entrance age for first grade in all four towns was the same; five years nine months as of September first.

The testing program began the second week of the school year; the letter knowledge tests were administered the first week, followed in the second week by *Murphy-Durrell Diagnostic Reading Readiness Test* and the intelligence tests. The *Otis Test* was used in three of the communities; in the fourth, the *California Mental Maturity Test* was a part of the regular testing program and was used instead of the *Otis*.

The scoring of tests was done by classroom teachers in order to have the results of the tests immediately available for initiating the reading program. Scoring procedures were outlined in detail in the manuals and were further explained in meetings of teachers. Strip scoring keys were provided for most tests, and specific interpretation of scoring and recording was given. The test booklets were later extensively spot-checked for accuracy; the number of errors in scoring were negligible. Since the test of writing letters and writing one's name presented an element of subjectivity in scoring, special attention was given these tests in spot-checking; again there were few errors in scoring.

Large master sheets were prepared for recording the data which were punched on standard IBM cards. Each child's record was coded in such a fashion to make possible his identity through sex, class, teacher, and community coding.

The total population comprised 2,339 children; however, because in some instances one of the tests of the battery was not taken, the total number was reduced to 2,188.

TABLE II. Chronological Ages of 2,188 First-Grade Children

Chronological Age (in months)	*Frequency*
97–99	2
94–96	1
91–93	12
88–90	36
85–87	31
82–84	78
79–81	417
76–78	517
73–75	538
70–72	488
67–69	66
64–66	0
61–63	2

Mean	75.86	Median	75.00
S.D.	4.47	Q	3.5

The mean chronological age of the 2,188 first-grade children computed on October 15, 1955 was 75.86 months. The range of ages is from 61 to 99 months. The standard deviation is 4.47; the median, 75.

Table III shows the mental ages of the children. These were group test mental ages, with three communities using *Otis Quick-Scoring Mental Ability Test* and one using *California Mental Maturity*.

TABLE III. Mental Ages of 2,188 First-Grade Children

Mental Ages (in months)	*Frequency*
120 and above	6
115–119	2
110–114	23
105–109	33
100–104	69
95–99	112
90–94	236
85–89	439
80–84	488
75–79	382
70–74	208
65–69	116
60–64	38
55–59	22
50–54	9
45–49	5

Mean	82.90	Median	83.00
S.D.	10.45	Q	6.00

Table IV shows a distribution of the intelligence quotients of the children.

TABLE IV. Intelligence Quotients of 2,188 First-Grade Children

Intelligence Quotients	*Frequency*
150 and above	13
140–149	41
130–139	118
120–129	296
110–119	557
100–109	702
90–99	316
80–89	118
70–79	25
60–69	2

Mean	109.5	Median	108.0
S.D.	14.0	Q	8.0

The mean intelligence quotient of 109.5 indicates that the group as a whole was in the high normal range. The large standard deviation attests to the heterogeneity of the total group.

Test of Rate of Learning Words

The rate of learning words was determined by the *Murphy-Durrell Diagnostic Reading Readiness Test.* Ten words were presented on flash cards, five of which were accompanied by pictures. The words were shown to children in a small group and each word was discussed and practiced for a minute in a standard presentation; this was followed by ten minutes of practice on all ten words. An hour later each pupil was tested individually for recognition of the words and was helped on those he did not remember. Two individual test periods follow, one during the middle of the day and one before the close of the day. Each score is recorded. The child's score on the third test is the learning rate.

The results of the learning rate test are shown in Table V.

TABLE V. Scores of 2,174 Pupils on Learning Rate Test

Raw Score	*Frequency*	*Per Cent*
10	106	4.87
9	88	4.05
8	119	5.47
7	169	7.77
6	220	10.12
5	245	11.27
4	316	14.53
3	345	15.87
2	275	12.65
1	205	9.43
0	86	3.95
Totals	2,174	99.98

Mean	4.41	Median	4.00
S.D.	2.62	Q	2.00

If reading readiness means the ability of the child to learn and retain a sight vocabulary, it is apparent that many first-grade children are ready to read at the second week of the first grade. The presentation of ten words constitutes a difficult task, much harder than the first lessons of the primers; yet approximately a third of the children retain six or more of the words taught.

LETTER KNOWLEDGE TESTS

Matching Letters

Letter knowledge was measured on many levels, from simple matching to the ability to write letters. The first and easiest level of letter perception is the ability to match letters directly. The two sample items and the first test item were the following:

O	T	O	H	D	C
X	F	J	X	R	T
A	L	Y	E	A	F

The child was told to find another letter like the one in the left-hand box and circle it. Through the use of the blackboard and standard directions in the manual, each child understood what was expected. All letters were tested in this manner; a similar test measured the ability to match lower-case letters.

TABLE VI. Ability of First-Grade Children to Match Letters

Capital Letters			Lower-Case Letters		
Number	*Frequency*	*Per Cent*	*Number*	*Frequency*	*Per Cent*
26	1,494	68.28	26	840	38.43
25	385	17.59	25	561	25.66
24	138	6.30	24	377	17.25
23	67	3.06	23	180	8.23
22	25	1.14	22	84	3.84
21	9	.41	21	43	1.97
20	4	.18	20	24	1.10
19	3	.13	19	22	1.01
18	3	.13	18	6	.27
17	6	.27	17	3	.13
16	3	.13	16	5	.23
15	1	.04	15	5	.23
14	3	.13	14	3	.13
13	3	.13	13	5	.23
12	4	.18	12	1	.04
11	9	.41	11	3	.13
10	3	.13	10	0	.00
9	2	.09	9	0	.00
8	2	.09	8	1	.04
7	7	.31	7	3	.13
6	2	.09	6	5	.23
5	3	.13	5	2	.09
4	6	.27	4	4	.18
3	3	.13	3	3	.13
2	0	.00	2	2	.09
1	0	.00	1	1	.04
0	3	.13	0	3	.13
Totals	2,188	99.83		2,188	99.94
Mean	25.34	Median 26.0	Mean	24.48	Median 25.0
S.D.	3.06	Q 0.5	S.D.	2.98	Q 1.0

The results of this test are particularly noteworthy, since this type of matching exercise is often found in reading readiness workbooks. Obviously this task is much too easy to be of value since 96 per cent of the pupils make scores higher than 22 on capitals, and 20 on lower-case letters. Time spent on such exercises would appear to be wasted effort for most pupils.

Identifying Letters Shown

The second level of letter knowledge measured was the ability of the children to identify letters shown. Each letter was shown on a large card

for five seconds; the child was expected to find it among five letters in a multiple-choice situation. For example, the letter *P* was shown on the examiner's card; the child found and circled it in this situation:

E	X	B	P	R

TABLE VII. Ability of First-Grade Children to Identify Letters Shown

Capital Letters			Lower-Case Letters		
Number	*Frequency*	*Per Cent*	*Number*	*Frequency*	*Per Cent*
26	844	38.66	26	315	14.90
25	370	16.95	25	291	13.76
24	244	11.18	24	353	16.70
23	176	8.06	23	300	14.19
22	141	6.46	22	228	10.78
21	111	5.08	21	163	7.71
20	53	2.43	20	97	4.59
19	42	1.92	19	79	3.74
18	44	2.01	18	54	2.55
17	23	1.05	17	65	3.07
16	18	.82	16	42	1.99
15	15	.69	15	27	1.28
14	17	.78	14	18	.85
13	12	.55	13	14	.66
12	12	.55	12	16	.76
11	10	.46	11	8	.38
10	6	.27	10	9	.43
9	9	.41	9	4	.19
8	1	.04	8	4	.19
7	2	.09	7	7	.33
6	10	.46	6	5	.24
5	4	.18	5	5	.24
4	3	.14	4	2	.09
3	6	.27	3	2	.09
2	3	.14	2	1	.05
1	3	.14	1	1	.05
0	4	.18	0	4	.19
Totals	2,183	99.97		2,114	99.90
Mean 23.52		Median 25.00	Mean 22.12		Median 23.00
S.D. 4.18		Q 2.00	S.D. 3.88		Q 2.00

First-grade children do well in the ability to match letters from memory of letters shown, especially with capital letters. Nearly 90 per cent were able to identify twenty or more letters; the mean score is 23.5, the median, 25. Children had greater difficulty in identifying lower-case letters; yet 83 per cent were able to identify more than twenty letters, with the mean being 22.1, the median 23.

Identifying Letters Named

The third level of letter knowledge tested was the ability to identify letters named. As the examiner named each letter, the child was expected

to circle it in a multiple-choice situation similar to that required in the previous tests. The same distractors were used in all letter knowledge tests, but the order in each box was varied in each test in order to avoid pattern responses. The results of the tests are as follows:

TABLE VIII. Ability of First-Grade Children to Identify Letters Named

Capital Letters			Lower-Case Letters		
Number	*Frequency*	*Per Cent*	*Number*	*Frequency*	*Per Cent*
26	418	19.16	26	26	1.19
25	162	7.43	25	32	1.47
24	96	4.40	24	51	2.33
23	83	3.81	23	61	2.79
22	74	3.39	22	73	3.34
21	60	2.75	21	63	2.88
20	63	2.89	20	66	3.02
19	50	2.29	19	70	3.20
18	63	2.89	18	72	3.30
17	57	2.61	17	73	3.34
16	72	3.30	16	71	3.25
15	73	3.35	15	94	4.30
14	70	3.21	14	92	4.21
13	74	3.39	13	84	3.85
12	82	3.76	12	117	5.36
11	78	3.58	11	114	5.22
10	75	3.44	10	123	5.63
9	105	4.81	9	148	6.78
8	80	3.67	8	125	5.72
7	89	4.08	7	114	5.22
6	65	2.98	6	160	7.33
5	70	3.21	5	104	4.76
4	51	2.34	4	87	3.98
3	33	1.51	3	72	3.30
2	19	.87	2	38	1.74
1	11	.50	1	28	1.28
0	8	.37	0	26	1.19
Totals	2,181	99.99		2,184	99.98
Mean 16.62		Median 17.00	Mean 12.04		Median 11.00
S.D. 7.66		Q 7.50	S.D. 6.52		Q 5.00

Although the ability to identify letters named was more difficult than identification of forms of letters, first-grade children show a relatively high ability to identify letters, especially capital letters. Approximately one-fifth of the pupils could identify all capital letters; 44 per cent could identify 20 or more; the mean number was 16.6, the median 17. Lower-case letters were less well known; 17 per cent could identify 20 or more; the mean was 12.0, the median 11.

Giving Names of Letters

The ability of children to name letters was tested individually. The letters were printed on a large card; they were widely spaced to avoid

confusion. The examiner pointed to each letter and asked the child to tell its name.

TABLE IX. Ability of First-Grade Children to Name Letters

Capital Letters			Lower-Case Letters		
Number	*Frequency*	*Per Cent*	*Number*	*Frequency*	*Per Cent*
26	265	12.13	26	52	2.38
25	83	3.80	25	37	1.69
24	80	3.66	24	40	1.83
23	66	3.02	23	40	1.83
22	60	2.75	22	49	2.24
21	57	2.60	21	61	2.79
20	37	1.69	20	48	2.20
19	42	1.92	19	44	2.01
18	44	2.01	18	45	2.06
17	48	2.20	17	49	2.24
16	42	1.92	16	60	2.75
15	41	1.88	15	40	1.83
14	48	2.20	14	56	2.56
13	56	2.56	13	54	2.47
12	41	1.88	12	57	2.60
11	59	2.70	11	55	2.52
10	56	2.56	10	70	3.21
9	73	3.34	9	72	3.30
8	80	3.66	8	63	2.88
7	77	3.52	7	67	3.06
6	104	4.76	6	101	4.62
5	94	4.30	5	118	5.40
4	115	5.27	4	152	6.96
3	145	6.64	3	182	8.33
2	142	6.50	2	221	10.12
1	111	5.08	1	179	8.20
0	118	5.40	0	172	7.88
Totals	2,184	99.95		2,184	99.96
Mean	12.20	Median 10.00	Mean	9.00	Median 6.0
S.D.	9.08	Q 8.50	S.D.	7.50	Q 6.5

The ability to name letters was much more difficult than the ability to identify letters named. However, about 30 per cent could name 20 or more capital letters; the mean score was 12.2, the median 10. Less familiarity was shown with lower-case letters, despite the similarity with a few capital letters; yet 15 per cent were able to name 20 or more lower-case letters; the mean score was 9, the median 6.

Writing Letters from Dictation

The ability to write letters from dictation was tested by giving the name of the letter and asking the child to write or print it on the line shown. Either capital or lower case form was accepted, and scoring standards were established for acceptability of form.

TABLE X. Ability of First-Grade Children to Write Letters Named

Number	*Frequency*	*Per Cent*
20–26	424	19.41
15–19	258	11.86
10–14	294	13.45
5–9	450	20.59
0–4	758	34.69
Totals	2,186	100.00

Mean	9.98	Median	8.00
S.D.	8.34	Q	7.00

The average child was able to write 10 letters; the median was 8. Only 3.4 per cent were able to write all 26 letters. The wide range of ability is shown by the standard deviation of 8.34.

Giving Sounds of Letters

The ability to give sounds of letters was tested individually in the same manner as the test for giving letter names. The order of presentation was from easiest to hardest, as determined by previous studies. The letters Q and X were omitted because of the difficulty of giving the sound in isolation.

TABLE XI. Ability of First-Grade Children to Give Sounds of Letters

Capital Letters			Lower-Case Letters		
Number	*Frequency*	*Per Cent*	*Number*	*Frequency*	*Per Cent*
20–24	69	3.16	20–24	47	2.17
15–19	115	5.29	15–19	84	3.87
10–14	147	6.78	10–14	124	5.71
5–9	236	10.87	5–9	184	8.47
0–4	1,603	73.87	0–4	1,731	79.76
Totals	2,170	99.97		2,170	99.98

Mean	3.88	Median	1.0	Mean	3.08	Median	0.0
S.D.	5.66	Q	2.5	S.D.	5.06	Q	1.5

First-grade children showed little familiarity with sounds of letters; 49 per cent of the group had zero scores on capital letters, 56 per cent could give no sounds for lower-case letters. Only 3 per cent could give the sounds of 20 or more capital letters; the median score was 3.88, with a standard deviation of 5.66.

Identifying Sounds in Words

The ability of the child to identify beginning and ending sounds in words was tested by the *Murphy-Durrell Diagnostic Reading Readiness Test.* It is made up of 84 pictures. For each item, the teacher pronounces a key word and the name of the picture. When the key word and the name of the picture start alike in items 1 to 48, or when the key word and the name of the picture end alike in items 49 to 84, the child marks the picture with a cross.

TABLE XII. Ability of First-Grade Children to Identify Sounds in Words

Raw Score Intervals	*Frequency*	*Per Cent*
80–84	52	2.38
75–79	81	3.71
70–74	67	3.07
65–69	102	4.67
60–64	147	6.74
55–59	73	3.35
50–54	163	7.47
45–49	165	7.57
40–44	89	4.08
35–39	199	9.12
30–34	181	8.30
25–29	86	3.94
20–24	131	6.01
15–19	122	5.59
10–14	73	3.35
5–9	87	3.99
0–4	363	16.64
Totals	2,181	99.98

Mean	35.80	Median	36.00
S.D.	23.85	Q	21.00

If a child is to find the "system" of phonetic writing, it is first necessary for him to recognize the separate sounds which make up the spoken word. In the test of this ability, the average first grader made scores of 35.8; this does not mean, however, that he recognized that number of different sounds, since each sound was tested more than once. The wide range of ability in identifying sounds in words is indicated by the standard deviation of 23.85.

Ability to Write Own Name

Each child was asked to write his own name, his first name and his last name. Only the first name was scored, however. A score of 3 was given if the child could write or print, in capitals or lower-case letters, all of the letters in his name. A score of 2 was assigned if more than half of the letters were written; a score of 1 indicates a lower achievement.

TABLE XIII. Ability of First-Grade Pupils to Write Own First Name

Raw Score	*Frequency*	*Per Cent*
3	1,580	72.24
2	344	15.73
1	263	12.03
Totals	2,187	100.00

Mean	2.60	Median	3.00
S.D.	.73	Q	.50

Visual Memory for Words

Visual memory for words was tested by the *Murphy-Durrell Diagnostic Reading Readiness Test.* Word cards in large print are shown for five seconds; the child identifies the word shown in a multiple-choice situation and circles it.

TABLE XIV. Ability of First-Grade Children in Visual Memory of Words Shown

Scores	*Frequency*	*Per Cent*
20–26	152	7.15
15–19	471	22.22
10–14	861	40.61
5–9	552	26.03
0–4	84	3.96
Totals	2,120	99.97

Mean	12.16	Median	12.00
S.D.	4.70	Q	3.00

ORDER OF DIFFICULTY OF LETTERS AT DIFFERENT LEVELS OF PERCEPTION

A random sample of 200 tests was used in arriving at an order of difficulty of letter knowledges. It should be understood that in the group tests (matching letters, identifying letters shown, identifying letters named) that the difficulty is determined in part by the selection of the distractors in the multiple-choice situation. Since the same distractors were used in each case, but in different order, the situations were relatively the same in these tests.

Matching Capital Letters Directly

The number under each letter indicates the number of errors made by the 200 pupils. This is true in all subsequent presentations.

K	X	I	Q	J	O	U	M	T	C	L	S	P
3	4	4	5	5	6	6	6	6	6	6	6	6
A	V	Z	E	N	R	G	B	W	Y	F	D	M
6	7	7	8	8	10	10	10	10	11	12	13	18

Matching Lower-Case Letters Directly

l	e	z	t	a	c	g	x	y	k	h	w	m
1	1	2	2	2	2	3	3	3	3	3	3	3
s	r	o	j	v	u	n	b	f	q	d	i	p
3	4	4	5	5	7	8	17	23	24	26	27	91

Identifying Capitals Shown

O	X	B	A	I	S	T	P	L	D	V	C	N
2	8	10	10	12	12	13	15	16	16	17	18	18
E	H	Q	U	F	Z	W	G	R	M	J	K	Y
18	19	19	21	24	26	29	32	33	34	37	40	40

Identifying Lower-Case Letters Shown

s	m	x	v	e	l	o	y	z	w	r	k	t
5	8	10	10	11	11	12	14	14	16	20	20	21
c	g	j	h	n	u	a	i	f	d	b	q	p
21	22	25	29	30	31	31	48	52	84	93	94	99

Identifying Capitals Named

O	A	X	S	H	L	R	P	F	B	W	D	N
26	27	32	55	62	65	69	74	76	77	77	79	82
T	U	K	Y	J	C	I	M	G	Z	E	Q	V
85	85	87	87	87	87	87	92	93	93	94	108	109

Identifying Lower-Case Letters Named

x	s	o	w	k	y	z	c	h	m	v	r	j
38	47	56	77	79	84	85	90	103	105	106	113	116
a	t	e	n	f	u	i	l	g	d	b	p	q
118	120	128	128	129	140	140	141	141	142	147	148	177

Naming Capital Letters

O	X	A	B	S	T	R	N	C	I	P	L	E
42	69	78	78	91	98	108	110	111	114	114	115	120
H	K	M	Y	D	Z	W	J	F	U	Q	G	V
120	121	123	125	127	128	133	134	136	136	143	145	149

Naming Lower-Case Letters

o	x	s	c	i	p	y	k	m	w	z	e	a
41	64	97	114	116	118	125	127	133	133	139	143	144
n	r	t	j	v	u	f	b	h	g	d	l	q
148	150	151	153	154	160	162	162	168	171	173	177	189

Writing Letters from Dictation

O	X	A	B	T	I	F	N	E	R	L	P	M
63	93	94	108	111	122	125	128	128	129	132	132	132
S	C	H	K	Y	U	D	W	Q	Z	V	J	G
132	133	135	139	145	145	148	156	158	160	166	167	167

Giving Sounds of Capital Letters

S	T	B	A	J	K	D	O	F	P	M	C
131	148	154	165	170	170	171	171	173	174	177	178
G	Z	V	H	N	L	R	I	E	U	W	Y
178	179	180	181	183	183	183	183	184	187	189	193

Giving Sounds of Lower-Case Letters

s	o	t	k	p	z	m	j	b	n	c	g
150	157	163	169	172	178	179	179	180	181	182	182
a	h	r	v	f	e	d	i	l	w	u	y
182	183	183	183	184	184	186	186	188	189	190	192

RELATIONSHIPS OF VARIOUS LEVELS OF LETTER KNOWLEDGE TO CHRONOLOGICAL AGE, MENTAL AGE, LEARNING RATE

Since chronological age is the usual basis for first-grade admission, it was desired to discover the relationships between chronological age and various background abilities brought to first grade. For this purpose, the population of 2,188 first-grade children was divided into quartiles by chronological age; then median scores on various measures were computed for each quartile.

TABLE XV. Chronological Age Quartiles Versus Various Measures of 2,188 First-Grade Children

Measure	*Quartile 1* Median	*Quartile 2* Median	*Quartile 3* Median	*Quartile 4* Median
Chronological age (months)	71	74	77	80
Mental age (months)	81	82	84	84
Learning rate (10 words)	4	4	4	4
Matching capitals	26	26	26	26
Matching lower case	25	25	25	25
Identifying capitals shown	24	25	25	25
Identifying lower case shown	23	23	23	24
Identifying capitals named	15	15	18	20
Identifying lower case named	10	10	11	13
Naming capital letters	8	8	11	13
Naming lower case	5	5	7	8
Writing letters	5	7	9	10
Giving sounds of capitals	0	0	0	1
Identifying sounds in words	34	33	36	39
Visual memory for words	10	11	12	13

Although there is a difference of nine months of chronological age between the lowest and highest quartile, the differences in scores on the various measures indicate rather small increments between these quartiles. The most surprising finding is that of the failure of the group test mental ages to follow the chronological ages. A difference of nine months in chronological age produces a difference of only three months in mental age. Computing median intelligence quotients for these quartiles, one finds the following:

INTELLIGENCE QUOTIENTS

Quartile 1	*Quartile 2*	*Quartile 3*	*Quartile 4*
114	111	109	105

The usual explanation for lower I.Q.'s of older children in a grade does not hold in this case, since there were very few "repeaters" and no "accelerated pupils" in the study. Apparently the intelligence tests are not sensitive to gains in mental maturity produced by a few more months of chronological age at this level.

Correlations between chronological age and the various measures were computed on a random sample of 270 children. The correlations were as follows:

Chronological age versus:	
Intelligence quotient	−.031
Mental age	.074
Learning rate	.018
Capital letters matched	.057
Lower-case letters matched	.129
Identifying capitals shown	.165
Identifying lower case shown	.074
Identifying capitals named	.121
Identifying lower case named	.165
Naming capitals	.100
Naming lower-case letters	.112
Writing letters	.098
Identifying capitals sounded	.075
Identifying lower case sounded	.055
Identifying sounds in words	.034
Writing name	.117
Identifying words shown	.116

These low correlations indicate further that chronological age provides a very poor basis for predicting any of the factors related to word background knowledge.

Relationships to Mental Age

Mental ages were derived from *Otis Quick-Scoring Mental Ability Tests*, given in three communities, and from *California Mental Maturity Test*, given in one community. The mental ages were divided into quartiles, and median scores in each measure were computed for each quartile.

TABLE XVI. Mental Age Quartiles Versus Various Measures of 2,188 First-Grade Children

Measure	*Quartile 1 Median*	*Quartile 2 Median*	*Quartile 3 Median*	*Quartile 4 Median*
Mental age (months)	72	80	85	93
Chronological age (months)	74	75	76	77
Learning rate (10 words)	3	4	4	5
Matching capitals	26	26	26	26
Matching lower case	24	25	25	26
Identifying capitals shown	23	25	25	26
Identifying lower case	22	23	23	24
Identifying capitals named	11	16	19	24
Identifying lower case named	7	10	12	16
Naming capitals	5	8	11	19
Naming lower case	3	5	7	13
Writing letters	3	6	9	16
Giving sounds of capitals	0	0	1	4
Identifying sounds in words	27	33	36	48
Visual memory for words	10	11	12	14

There was a median difference of 21 months of mental age between the first and fourth quartiles. The relatively low relationship to chronological age is again shown in the difference of only three months of age between the top and bottom mental age quartiles. Differences between letter knowledge abilities of these quartiles is minor, until the level of identifying letters named is reached; there is a marked difference in achievements of letter knowledge in the more difficult levels. However, it must be noticed that these differences in mental age are very large differences; it should be further noticed that the learning rate medians show relatively small increments.

Correlations between mental age and the various measures computed on a random sample of 270 cases were as follows:

Mental age versus:	
Intelligence quotient	.918
Chronological age	.074
Learning rate	.374
Matching capital letters	.194
Matching lower-case letters	.241
Identifying capitals shown	.327
Identifying lower case shown	.328
Identifying capitals named	.343
Identifying lower case named	.370
Naming capitals	.331
Naming lower-case letters	.350
Writing letters	.389
Giving sounds of capitals	.362
Giving sounds of lower case	.339
Identifying sounds in words	.308
Writing name	.154
Visual memory for words	.424

Correlations between mental age and the various factors were somewhat higher than correlations with chronological age.

Relationships to Learning Rate

The learning rate, as measured by retention of 10 words taught in the *Murphy-Durrell Diagnostic Reading Readiness Test*, was compared to scores on the various measures. Learning rates were divided into quartiles; median scores were computed for these quartiles.

TABLE XVII. Learning Rate Quartiles Versus Various Measures of 2,188 First-Grade Children

Measure	*Quartile 1* Median	*Quartile 2* Median	*Quartile 3* Median	*Quartile 4* Median
Learning rate (10 words)	1	3	5	8
Chronological age (months)	75	74	76	77
Mental age (months)	79	82	83	86
Identifying capitals shown	23	24	26	26
Identifying lower case	22	23	23	24
Identifying capitals named	11	15	20	25
Identifying lower case named	7	10	12	17
Naming capitals	4	8	13	21
Naming lower case	3	5	8	14
Writing letters	3	6	10	16
Visual memory for words	10	11	12	14
Identifying sounds in words	27	30	37	48

Retention of words taught in a group situation would appear to be the most valid measure of readiness to read. While ten words is a rather large assignment, the highest quartile of pupils retained eight words, the lowest only one.

Comparisons of the highest and lowest quartiles show interesting results. Tests which call for matching or recognizing form only, whether of letters or of words, show little difference between good and poor readers. Tests which call for a knowledge of letter names, writing letters, or the ability to identify sounds in words, show great differences.

Since the learning rate was the only direct measure of learning to read, correlations between it and the various factors are especially interesting. In order to show the relative importance of each factor, correlations with learning rate are shown in diminishing order.

Rate of learning words versus:

Identifying lower case named	.509
Naming lower-case letters	.473
Writing letters	.470
Naming capital letters	.461
Identifying capitals named	.442
Giving sounds of capitals	.384
Identifying words shown	.383
Mental age	.374
Intelligence quotient	.362
Giving sounds of lower case	.361
Identifying lower case shown	.341
Identifying sounds in words	.301
Identifying capitals shown	.291
Matching lower-case letters	.222
Matching capital letters	.177
Writing name	.166
Chronological age	.018

It will be noted that all but one of the factors which show a higher correlation with learning rate than does mental age, are ones which associate the name of the letter with its form. The single exception is identifying words shown. Tests of letter knowledge which associate name and form of letter appear to be the best indicators of learning rate.

Reading a phonetic language requires a high degree of perception of visual forms representing sounds. Since the sound of each letter appears in its name (with the exception of *w* and *h*), tests which call for the association of letter form and name are measures of phonetic ability. At the same time, the association of name with form represents a higher or more meaningful perception of letter form. Both visual and auditory perception are measured in such tests.

Certain of the lower correlations appear to require explanation. Giving sounds of lower-case letters is only slightly below mental age in correlation rank. Table XI shows that very few children knew sounds of lower-case letters; the skewing of the distribution would prevent a higher correlation. As children learned sounds of letters, a higher correlation with learning to read would be expected. Exactly the opposite situation is found with matching capitals and lower-case letters; the ability was so universal that all scores were skewed to the top of the distribution. Identifying sounds in words would appear to test phonetic relationships, but does not require the association of sound with letter. The association of sound or name with letters seems to be the primary requisite for a high rate of learning words.

Other Findings

Sex difference studies showed girls superior to boys in all tests; these differences were statistically significant in all but four sub-tests. More complete information in relation to September test findings on this group of children may be found in the following study: Nicholson, Alice; *Background Abilities Related to Reading Success in First Grade;* Ed.D. thesis, Boston University, 1957. Copies on microfilm may be obtained from: University Microfilms, Ann Arbor, Michigan.

CONCLUSIONS

Measures of various abilities of 2,000 first-grade children in the second week of school provide a number of suggestions for the teaching of reading and for first-grade admission practices.

Children bring to first grade wide differences in learning rates and in letter and sound perception. These differences are so great that the following conclusions seem inescapable:

1. That many children are ready to read from the first day of school; for them, instruction in current reading readiness programs is entirely unnecessary.
2. Quite different levels and content of instruction must be provided for the reading readiness period; there are marked differences in learning rate, in levels of letter knowledge, and in ability to perceive sounds in words.

3. Very few children need perceptual experiences on the "letter matching" level. Almost every child is able to match letters correctly; certainly the lower abilities of matching non-word forms and pictures are not needed in reading readiness programs.

A study of relationships among various factors measured indicates that the following conclusions are justified:

1. Chronological age provides a most insecure basis for first-grade admission. Younger children in the grade brought backgrounds of learning rate and perceptual abilities almost equal to those of older children. Even mental age showed little growth between chronological age quartiles; nine months of increase in chronological age was accompanied by an increase of only three months in mental age. No solution to first-grade reading difficulties is to be found by raising first-grade entrance age.
2. A knowledge of the names of letters provides the greatest assurance of learning to read. Tests which measure association with name and form of letter show the highest correlations with learning rate for words.
3. High mental age does not assure a high learning rate in beginning reading. Although children with very high mental ages have better letter knowledge, it is apparently the letter knowledge rather than the mental age which produces the high learning rate.

Chapter III

GROWTH IN WORD PERCEPTION ABILITIES AS IT RELATES TO SUCCESS IN BEGINNING READING

ARTHUR V. OLSON

It was desired to follow the growth in reading and word perception of the children who were measured in September. The instructional program for the group consisted of emphasis on letter names, on auditory discrimination of word elements, the beginnings of phonics; in addition, all pupils were learning new words from the first day, but the major systematic attention was given to building perceptual backgrounds of word elements. A more complete description of methods followed appears in Chapter 5.

The measurement of early stages of growth should provide further knowledge of the rate of attainment of various perception abilities, the relationships among these various abilities, and their significance in learning to read. To the September measures were added a group testing program in the second week of November and an individual and group testing program in the first week of February.

November group tests consisted of the following:

Identifying capital and lower-case letters shown.
Identifying capital and lower-case letters named.
Writing letters.
Auditory perception of word elements.
Identifying words shown.

The use of these tests had two purposes; to discover amounts of growth in these perception abilities, and to emphasize to the teachers their importance in the teaching program. All of the tests were similar to those used in September, except that of auditory perception of word elements. This function was tested by parts A and B of the *Boston University Hearing Sounds in Words Test*[1]. This tests the child's ability to identify sounds in spoken words, indicating recognition of initial sounds, final sounds, and both initial and final sounds by circling suitable letters and words in multiple-choice situation.

All of the November group tests were repeated in February; in addition, individual tests were given to 1,172 children, testing the following abilities:

Oral reading, including a sight vocabulary inventory.
Giving names of capital and lower-case letters.
Giving sounds of letters and consonant blends.
Applied phonics.

A description of these tests is given prior to the tables in which the results of the tests appear.

Individual tests were administered by the language arts staff of the University, and by advanced students in elementary education trained in uniform procedures of administering and recording test results. These tests required approximately fifteen minutes per child; it was impossible to test the entire population of 2,000 children within a ten-day period.

[1]Durrell, Donald D. *Improving Reading Instruction.* World Book Co. 1956. Pages 104–107.

However, there were 1,172 children for whom complete data was obtained in all tests in September, November, and February.

Descriptive Data of 1,172 Children

A comparison of the chronological ages, mental ages, and intelligence quotients of the population of this study with the entire entering first-grade population is shown in Table XVIII below.

TABLE XVIII. September Chronological Ages, Mental Ages, and Intelligence Quotients of First-Grade Children

	Chronological Age		Mental Age		Intelligence Quotients	
Number	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
1,172	75.8	4.2	82.8	11.2	109.8	14.3
2,188	75.9	4.5	82.9	10.4	109.5	14.0

The limited group of 1,172 children appears to be representative of the total entering first-grade group, since the means and standard deviations are nearly equal in all factors in the above table.

Reading Achievements in February

Achievements in learning to read were measured by an oral reading test designed to inventory words from the basal readers used (Scott, Foresman) and certain other words of pre-primer and primer level. All words were placed in sentences which made a connected story. The total score was the number of words read correctly; possible score was 162. The first section of the test was made up of 73 words, mostly of the pre-primer level; the second section tested 59 words, mainly of the primer level; the third section contained 30 words of first-reader level. Examiners were trained in uniform administration and scoring of the test. The test had a chance-half reliability of .97.

A second measure of reading achievement was the *Detroit Word Recognition Test*, which is a silent reading test consisting of forty words and phrases with corresponding pictures. The child draws a line from the word or phrase to the correct picture. The authors report a reliability of .86 for grade 1 B.

TABLE XIX. February Reading Achievement Scores of First-Grade Children

Oral Reading Test		Detroit Word Recognition Test	
Scores	*Frequency*	*Score*	*Frequency*
160–169	4		
150–159	20		
140–149	26		
130–139	41	39–41	9
120–129	51	36–38	5
110–119	67	33–35	7
100–109	85	30–32	11
90–99	74	27–29	31
80–89	95	24–26	33
70–79	133	21–23	52
60–69	159	18–20	88
50–59	133	15–17	106
40–49	93	12–14	119
30–39	69	9–11	163
20–29	40	6–8	177
10–19	35	3–5	209
0–9	50	0–2	161
Mean 73.42	S.D. 35.76	Mean 10.84	S.D. 8.20

The distribution of scores on the oral reading test indicate its suitability as a measure. The mean score was 73; the wide variation in reading achievement is shown by the range of scores and by the standard deviation of 35.76. The *Detroit Word Recognition Test* was less sensitive as a measure of reading achievement. The mean score was 10.8, with a standard deviation of 8.2. In all later comparisons, the oral reading test score is used as the measure of reading achievement.

GROWTH IN LETTER KNOWLEDGE

Since all of the children received intensive training in various levels of letter knowledge, it was desired to learn the amount of growth in these abilities during the first semester.

Letter Knowledge Tests Showing Little Gain

Several of the tests of letter knowledge indicated such high achievement in September that little growth could be discovered by repeating them. Direct matching of letters was not repeated after the September tests showed mean scores of 25.1 for capital letters and 24.4 for lower-case letters.

Tests of identifying capital letters from memory of the letter shown on a flash card were also very easy for pupils in September. The September mean score was 23.5; the November mean score was 24.9, so that test was not given in February.

Identifying lower-case letters shown on flash cards was somewhat harder for September pupils, so the test was repeated in November and February. The resulting mean scores showed constant growth: September, 22.19, with a standard deviation of 3.94; November, 23.98, with a standard deviation of 3.07; February, 25.01, with a standard deviation of 2.05.

Identifying Letters Named

This test required the child to identify letters named by the examiner; the technique is described in Chapter 2.

TABLE XX. Ability of First-Grade Children to Identify Letters Named

	Capitals			Lower Case		
Number	*Frequency*			*Frequency*		
	September	*November*	*February*	*September*	*November*	*February*
26	226	468	892	17	85	402
25	91	180	108	19	127	215
24	58	87	59	28	139	195
23	43	69	28	39	117	110
22	41	44	23	33	92	76
21	31	29	12	30	64	35
20	36	34	12	38	50	39
19	30	35	5	38	46	11
18	32	27	2	48	57	11
17	26	23	3	37	35	17
16	42	16	3	41	48	10
15	40	24	5	49	37	6
14	42	18	9	49	42	4
13	38	20	1	45	25	10
12	40	19	2	63	34	6
11	35	15	0	58	18	8
10	42	13	4	66	34	6
9	53	10	2	80	31	3
8	42	7	1	65	21	3
7	46	10	0	60	15	1
6	34	7	0	78	12	0
5	45	4	0	60	18	0
4	26	3	1	44	9	1
3	16	2	0	41	10	1
2	6	2	0	22	1	0
1	6	0	0	14	0	0
0	5	6	0	10	5	2
Mean	16.87	22.26	25.16	12.22	18.98	23.59
S.D.	7.71	5.44	2.41	6.53	6.11	3.50

These first-grade children improved rapidly in the ability to identify letters named by the examiner. For capital letters the mean scores were as follows: September, 16.87; November, 22.26; February, 25.16. Mean scores for lower-case letters were: September, 12.22; November, 18.98;

February, 23.59. Very few children had difficulty in recognizing letters named in February; 95 per cent of the pupils recognized 21 or more capitals named and 10 or more lower-case letters named.

Giving Names of Letters

This test required the child to give names of letters. A comparison of September and February scores for capital and lower-case letters is presented in Table XXI.

TABLE XXI. Ability of First-Grade Children to Give Names of Letters

Number	Capitals *Frequency*		Lower Case *Frequency*	
	September	*February*	*September*	*February*
26	154	624	34	251
25	54	193	22	248
24	46	87	25	195
23	34	65	23	124
22	30	39	32	84
21	30	26	36	59
20	15	27	23	41
19	23	11	27	23
18	26	13	21	27
17	29	11	28	19
16	28	9	30	18
15	24	11	23	10
14	21	12	28	8
13	26	6	33	11
12	24	7	27	4
11	34	1	34	5
10	31	5	38	4
9	45	4	42	7
8	37	5	38	4
7	42	4	42	6
6	62	4	45	5
5	43	2	65	6
4	68	3	82	4
3	72	2	101	4
2	71	0	112	4
1	57	0	87	1
0	46	1	74	0
Mean	12.72	23.95	9.46	22.60
S.D.	9.09	3.96	7.91	4.47

The growth in naming capital letters between September and February is from 12.72 to 23.95, a gain of 11.23 letters. In naming lower-case letters, the increase was from 9.46 to 22.60, a gain of 13.14 letters. In February, 90 per cent of the children knew the names of 20 or more capital letters, 17 or more lower-case letters.

Giving Sounds of Letters

This ability was tested individually, with the child being asked to give the sounds of individual letters. Only lower-case letters were tested; the letters *q* and *x* were omitted from the test.

TABLE XXII. Ability of First-Grade Children to Give Sounds of Letters

Number	*September*	*February*
24	7	177
23	2	125
22	7	112
21	7	88
20	7	86
19	6	78
18	7	66
17	7	57
16	15	42
15	13	41
14	18	30
13	7	23
12	18	25
11	15	20
10	20	19
9	16	18
8	17	25
7	22	11
6	31	16
5	33	21
4	27	11
3	53	8
2	74	15
1	126	9
0	617	49
Mean	3.16	17.30
S.D.	5.37	6.79

There was a mean gain of 14.14 in giving sounds of lower-case letters, from a September mean of 3.16 to a February mean of 17.30.

Writing Letters

Writing or printing letters from dictation was tested in all three of the testing periods during the first semester. The growth in the ability is shown in Table XXIII. As in the previous tables, the number of children tested is 1,172.

TABLE XXIII. Ability of First-Grade Children to Write Letters Dictated

Number	*September*	*November*	*February*
26	37	106	202
25	41	122	213
24	33	82	185
23	28	84	104
22	38	70	74
21	37	62	34
20	34	67	48
19	20	47	40
18	25	43	29
17	22	33	22
16	40	42	18
15	33	37	19
14	35	48	8
13	32	41	10
12	22	31	7
11	36	30	9
10	30	18	8
9	34	27	10
8	58	24	5
7	49	20	5
6	53	26	7
5	55	22	3
4	65	18	6
3	61	15	1
2	55	16	6
1	59	18	1
0	140	23	8
Mean	10.44	17.44	22.23
S.D.	8.32	7.36	5.07

The children showed a constant growth in the ability to write letters from dictation, the mean number of letters written in September was 10.44; in November, 17.44; in February, 22.23.

Ability in Applied Phonics

Ability to apply phonics to solve new words was tested individually. Known and unknown words were paired; the first word was from the vocabulary of the primer, but was pronounced for the child if he did not recognize it. The child is told that the second word sounds like the first, but that the first letter is changed; for example, these two words were paired: *house—mouse.* The child is told, "This first word says *house.* This next word sounds like house at the end, but the *first* letter is different. Can you tell me this word?" Final sounds were tested in a similar fashion.

Initial sounds tested were the following: t, m, p, s, f, j, g, d, k, b, c, h, l, r, n, v, w; final sounds were d, p, s, t, f, m, r, and b. The highest possible score was 25. This test was given only in February.

TABLE XXIV. Ability of First-Grade Children in Applied Phonics

Scores	*Frequency*
20–25	201
15–19	214
10–14	184
5–9	146
0–4	447
Mean	9.70
S.D.	8.23

While there was a wide spread of scores on the test, the average child was able to use phonics to solve ten new words through single-letter changes in words.

Hearing Sounds in Words

The *Boston University Test of Hearing Sounds in Words* was given to the 1,172 children in November and January. This requires the child to identify beginning sounds, ending sounds, and both beginning and ending sounds in spoken words. He indicates his knowledge of the sound by circling the appropriate letters in a multiple-choice situation. Since this test is difficult for beginning children, only the first two sections of the test were given in November. The distribution of the scores indicates that children were not handicapped by the abridged test.

TABLE XXV. Ability of First-Grade Children to Identify Sounds in Words

Scores	*November*	*February*
65–69		4
60–64		16
55–59		63
50–54		123
45–49		159
40–44		208
35–39	13	185
30–34	71	131
25–29	137	99
20–24	195	92
15–19	247	56
10–14	299	31
5–9	174	6
0–4	36	4
Mean	16.92	37.69
S.D.	7.72	12.13

There was a marked growth in the ability to identify sounds in spoken words; the November mean was 16.92, as compared to a February mean of 37.69. No direct comparison is possible between the September test of this function and later tests, since the measures are different. The Septem-

ber test did not require a knowledge of letters; it asked only for an identification of pictures whose names began or ended like the sounds in the stimulus words.

RELATION OF READING ACHIEVEMENT TO VARIOUS TESTS IN SEPTEMBER AND FEBRUARY

In order to ascertain which of the various measures relate most closely to reading achievement in February, correlations were made with both September and February tests. The individual reading test was used as the criterion of reading achievement; this is primarily a measure of sight vocabulary in sentence context.

Reading Achievement Versus September Tests

Correlations between September test scores and February reading achievement are shown in the table below. While this report does not provide distributions of certain September tests on the limited population of 1,172 children, the distributions were virtually identical with those reported in the previous chapter.

TABLE XXVI. Correlations of February Reading Achievement with September Measures

February Reading Achievement versus:	
Identifying capitals named	.55
Writing letters	.55
Naming capitals	.55
Identifying lower-case letters named	.54
Naming lower-case letters	.53
Learning rate for words	.47
Giving sounds of capitals	.42
Mental age	.41
Intelligence Quotient	.41
Giving sounds of lower-case letters	.40
Identifying words shown	.39
Identifying lower-case letters shown	.37
Identifying capitals shown	.33
Identifying sounds in words	.33
Matching capital letters	.25
Matching lower-case letters	.23
Chronological age	−.04

In predicting February reading achievements from September test results, the most useful measures are those which associate letters with their names. All of the tests showing correlations higher than .50 with reading achievement are tests of knowledge of name or sound of letters: identifying capitals named, writing letters named, naming capital letters, naming lower-case letters. The only test of letter-sound relationship which correlates with reading achievement lower than does mental age is the September test of giving sounds of lower-case letters; this is accounted

for by low performances of most pupils on the test. The correlation of .40 is surprising in view of the skewing toward zero scores.

The tests which fail to associate letter forms with names or sounds all show lower correlations. Letter matching is so universal among entering first-grade children that it cannot be used as a predictive measure. While there is a fairly good range of scores on tests of identifying letters shown, the knowledge of letter form alone appears to be a poor predictive measure. Identifying sounds in spoken words without attaching sound to letter also shows a low correlation with reading achievement.

Chronological age is the poorest predictor of February reading achievement; the correlation is negative, −.04.

Reading Achievement Versus February Measures

Since there were large increments of growth in letter-perception abilities between September and February, correlations between these abilities and reading achievement would be expected to increase. Low scores in letter knowledge in September may have resulted from lack of opportunity for learning; children with high learning potentials increased rapidly in ability when the opportunity for learning was provided.

TABLE XXVII. Correlations of February Reading Achievement with February Measures

February Reading Achievement versus:	
Detroit Word Recognition Test	.76
Ability in applied phonics	.70
Hearing sounds in words	.67
Giving sounds of lower-case letters	.64
Giving sounds of blends	.61
Naming lower-case letters	.57
Identifying words shown	.51
Writing letters	.47
Identifying lower-case letters named	.45
Naming capital letters	.44
Identifying capitals named	.34
Identifying lower-case letters shown	.22

Tests of ability in phonics relate highest with February reading achievement. The test of ability in applied phonics shows the highest correlation, .70. The test of ability to hear sounds in words is also a test of phonics; it asks the child to associate the sounds identified with printed letters. This was not true of the September form of this test. The improvement in correlation of giving sounds of lower-case letters is accounted for by the wider spread and higher mean scores of children in this ability.

The lower position of letter knowledge tests is the result of extremely high February scores. As the slower learners approached perfect scores in letter knowledge tests, the correlations with reading achievement were naturally lowered.

Since the February reading achievement test provides an almost complete inventory of words taught in the pre-primers of the basal series, scatter

diagrams of reading achievement deciles with letter and phonics knowledge should provide useful information in relation to the widely-held concept: "Don't teach word analysis skills until a sight vocabulary of 75 words is established."

TABLE XXVIII. February Tests of Naming Lower-Case Letters Versus Reading Achievement

Reading Deciles	*Ability to Name Lower-Case Letters*			
	0–10	*11–15*	*16–20*	*21–26*
124–162	0	0	0	117
106–123	0	0	0	117
91–105	0	0	1	116
79–90	1	0	2	114
70–78	1	1	4	111
63–69	0	2	13	102
56–62	2	5	16	94
44–55	1	7	31	78
29–43	9	12	32	64
0–28	31	10	29	47

Of the 1,172 children, only nine were able to learn 70 or more words without knowing the names of 20 or more lower-case letters. While a knowledge of letter names does not assure high reading achievement, the lack of that knowledge assures low reading achievement. Apparently a child *must* have a knowledge of letter names long before he masters 75 words.

TABLE XXIX. February Knowledge of Sounds of Lower-Case Letters Versus Reading Achievement

Reading Deciles	*Ability to Give Sounds of Lower-Case Letters*			
	0–10	*11–15*	*16–20*	*20–24*
124–162	1	0	17	99
106–123	0	3	23	91
91–105	3	5	40	69
79–90	3	7	35	72
70–78	7	9	35	72
63–69	13	17	47	40
56–62	19	27	46	25
44–55	27	31	41	18
29–43	53	24	24	16
0–28	75	16	19	7

Of the 201 children who knew the sounds of 10 or fewer letters, only 14 could read more than 70 words. Of the 509 children who knew sounds of 20 or more letters, 403 knew more than 70 words, while 106 knew less than 70. Again, knowledge of letter sounds does not necessarily assure high reading achievement, but lack of knowledge is usually associated with low reading achievement.

Other Findings

Studies of sex differences in February tests found girls superior to boys in reading achievement and in all tests of letter and phonics knowledge. Differences with critical ratios of three or more were the following: reading achievement, identifying lower-case letters named, hearing sounds in words, writing letters. Order of difficulty of items on the various tests were presented.

More complete information in relation to February test findings may be found in the following study: Olson, Arthur V.; *Growth in Word Perception as it Relates to Success in Beginning Reading*. Ed.D. thesis, Boston University, 1957. Copies on microfilm may be obtained from: University Microfilms, Ann Arbor, Michigan.

CONCLUSIONS

Measures of 1,172 first-grade children in November and February provided useful information about early stages of reading progress. Children are able to learn letter names rapidly in this period; the mean score for identifying lower-case letters named was 12 in September, 19 in November, and 24 in February. In giving names of letters and in writing letters named, a similar growth was shown.

Growth in ability in phonics is shown by a September mean ability to give sounds of three letters as against 17 in February. Rapid progress was made also in ability to identify sounds in spoken words and in ability to apply phonics to solving new words.

The most significant findings are in relationships between February reading achievement and the various tests of letter knowledge. The following conclusions seem justified by the findings:

1. September tests which measure knowledge of letter names provide the best predictions of February success in reading. All such tests show higher correlations with reading achievement than does mental age.
2. February tests of various types of ability in phonics show the highest correlations with reading achievement.

All findings are consistent with the conclusion that early teaching of letter names and of various aspects of phonics is essential to rapid progress in reading. There is no support for the assumptions that a sight vocabulary of 75 words should be established before word analysis instruction is given or that a mental age of seven is necessary for the use of phonics.

Chapter IV

JUNE READING ACHIEVEMENTS OF FIRST-GRADE CHILDREN

SYLVIA R. GAVEL

June tests of the same population of first-grade children studied in the two previous chapters provided a basis for comparison of the levels of reading achievement with status and growth in various word perception abilities measured earlier in the year. They also provided evidence of the effect of early instruction in letter names, sounds in words, and phonics lessons on reading achievement at the end of the year.

All of the tests in the June battery were group tests. While individual tests were made possible in February by using more than 100 advanced students as examiners, these students were not available in June.

Reading Achievement Tests

A word classification test which measured the meanings of 150 words was constructed from 82 words from the Scott Foresman first-grade level, 46 from the second readers, and 10 from third readers. This test asked the pupil to circle words which belonged to some classification. Typical directions were, "Circle the things that you can do"; "Circle the fruits"; "Circle the words that tell the size of things". This test had a chance-half reliability of .96.

A paragraph meaning test was constructed with a similar spread of vocabulary, with the child's comprehension being indicated in the usual manner of paragraph tests. The reliability of this test was .94. It was combined with the word classification test to determine the total reading score.

The *Detroit Word Recognition Test* was also given to determine reading achievement.

Tests of Letter and Word Perception

The following tests of letter and word perception were the same as those given in February:

Identifying lower-case letters named.
Identifying sounds in spoken words.
Writing letters from dictation.
Identifying words shown.

Two new tests were added: a test of ability to identify sounds of letters, and a test of applied phonics. In the test of identifying sounds of letters, the sound of the letter or consonant blend was given by the examiner and the child was asked to circle the appropriate letter or combination of letters in a multiple-choice situation. The reliability of this test was .86. In the test of applied phonics, the ability of the child to identify words not common to first readers, was measured by presenting a row of words such as the following:

fame lame flame game tame

The child was asked to put the number 1 under *tame*, number 2 under *lame*, etc. The possible score was 50; the reliability of the test was .96.

RELATION OF JUNE ACHIEVEMENT TO VARIOUS MEASURES

A study of the relationships of June reading achievement tests to September and February measures indicates the predictive powers of the earlier tests. The main value of September tests is the basis they provide for instructional planning; predictive values of the tests may be lowered by the changes resulting from instruction. June reading achievement scores combine vocabulary and paragraph tests.

September Tests Versus June Reading Achievement

Correlations between September tests and June reading achievement are shown, in descending order, in Table XXX.

TABLE XXX. Correlations Between June Reading Achievement and September Tests

June Reading Achievement versus:	
Writing letters dictated	.60
Naming capital letters	.58
Identifying capitals named	.56
Identifying lower-case letters named	.56
Naming lower-case letters	.54
Learning rate	.51
Intelligence quotient	.45
Mental age	.44
Sounding capital letters	.44
Identifying words shown	.43
Sounding lower-case letters	.39
Identifying sounds in words	.35
Identifying lower-case letters shown	.35
Identifying capitals shown	.32
Matching capital letters	.22
Matching lower-case letters	.22
Chronological age	−.06

With minor changes in order, the results are almost identical with Table XXVI which correlates September measures with February reading achievements. All tests which associated visual forms of letters with their names are higher predictors of June reading achievement. The short test of learning rate does better than intelligence tests. Among the correlations which are lower than that of mental age with reading are the tests which were either too easy in September (matching of letters), too hard (giving sounds of letters), or those which failed to measure the visual-auditory relationship (identifying letters shown, identifying words shown, identifying sounds in spoken words).

February Tests Versus June Reading Achievement

A description of the February measures and resulting distributions of scores is found in the preceding chapter. Many of the tests found too easy in September were dropped in the February battery; tests which were too

hard in September, such as giving sounds of letters, were suitable for the February population; growth in letter knowledge permitted a more effective test of identification of sounds in spoken words. Correlations of these measures with June reading achievements are found in Table XXXI.

TABLE XXXI. Correlations Between June Reading Achievement and February Tests

June Reading Achievement versus:	
Oral reading	.82
Detroit Word Recognition	.75
Hearing sounds in words	.69
Applied phonics	.64
Sounding lower-case letters	.61
Identifying words shown	.57
Naming lower-case letters	.51
Writing letters dictated	.50
Identifying lower-case letters named	.46
Naming capital letters	.39
Identifying capitals named	.31
Identifying lower-case letters shown	.26

The best February tests for predicting June reading achievement are, of course, those which are direct measures of reading ability. Next in order come the tests of various phonic abilities—hearing sounds in words, applied phonics, and sounding lower-case letters. It should be recalled that the February test of hearing sounds in words differs from the September test in that it utilizes letters instead of pictures for responses and thus measures the auditory-visual relationship. The lower correlations with letter knowledge result from the near-perfect scores in February on these tests.

Other Relationships Among June Measures

Table XXXII shows correlations of the various June tests with June reading achievement as measured by the combined scores of the word classification test and the paragraph test.

TABLE XXXII. Correlations Among June Measures of Various Aspects of Reading

Combined Reading Achievement versus:	
Word classification test	.98
Paragraph test	.87
Detroit Word Recognition	.79
Hearing sounds in words	.68
Identifying words shown	.63
Applied phonics	.58
Identifying lower-case letter sounds	.51
Writing letters dictated	.43
Identifying lower-case letters named	.35

JUNE READING ACHIEVEMENTS OF 1,506 FIRST-GRADE CHILDREN

Although there were 2,188 children tested in September, the number of children who followed the outlined teaching program and for whom complete test data were available was 1,506. The 682 children who were omitted from these findings are accounted for in the following ways: 300 were in the control group of the experimental study; 210 were following a basal reading system different from that in the study; the remainder had incomplete testing records or moved away from the communities.

The 1,506 children were typical of the original group. Mean scores and standard deviations were almost identical with the original population. Table XXXIII shows mean scores for the children from the four communities on certain September and June measures.

TABLE XXXIII. Mean Scores for 1,506 First-Grade Children in Four Communities

	Communities			
	A	*B*	*C*	*D*
Number of children	545	342	287	332
September Tests				
Chronological age (months)	75.7	75.8	76.1	75.7
Mental age (months)	83.6	80.8	81.8	85.5
Learning rate	4.7	3.8	4.0	4.9
Identifying capitals named	17.5	15.6	15.8	18.0
Identifying lower case named	13.0	10.7	11.4	13.4
June Tests				
Combined silent reading	71.5	70.0	65.5	61.2
Detroit Word Recognition	25.2	25.7	22.5	20.8
Hearing sounds in words	47.6	46.4	46.7	43.1
Applied phonics	43.4	43.8	42.2	41.3

The mean scores show that these populations were very similar in September, with Community D presenting the highest scores on all tests. Community B had the lowest scores on the September tests. Community C was the only town without kindergartens, yet the scores on learning rate and letter knowledge tests were similar to those in the other communities.

Community D, with the highest September scores, presented the lowest June achievement scores. This was the only community in which no local supervision was provided for the teachers; there was little exchange of teacher-built material, and only the occasional visits of the university supervising group. Apparently the local supervisory assistance was an important factor in the June achievements of the communities.

Scores from the *Detroit Word Recognition Test* show the following distributions of reading grades in June:

TABLE XXXIV. Grade Scores on the Detroit Word Recognition Test in June

	Communities							
	A		*B*		*C*		*D*	
Grade Level	N	%	N	%	N	%	N	%
above 3.0	191	30.3	112	28.6	47	16.2	73	18.5
2.0–2.9	291	46.2	192	49.1	163	56.2	156	39.5
1.6–1.9	88	14.0	58	14.9	42	14.5	88	22.3
below 1.6	59	9.4	30	7.6	39	13.4	78	19.7
Median Grade	2.5		2.6		2.3		2.1	
% reading above 2.0	76.5		77.7		72.4		58.0	

The reading program produced relatively high achievement in all communities except D. While these communities were somewhat above average in intelligence, the reading achievement is much above the national norms. The high proportion of children reading above 3.0 is an indication of the merit of omitting reading readiness exercises for children who have high learning rates and high letter knowledge scores in September.

Since one of the objectives of the study was the elimination of reading difficulties through providing early instruction in letter names, sounds in words, phonics, and meaningful practice in word recognition, it is desirable to study the size of sight vocabulary in June.

TABLE XXXV. Distribution of Scores on the June Test of Word Classification

Score	Frequency by Community			
	A (556)	*B* (347)	*C* (287)	*D* (332)
100–109	15	5	6	6
90–99	62	24	21	19
80–89	51	26	20	31
70–79	79	50	31	44
60–69	90	62	38	27
50–59	71	60	53	43
40–49	77	55	51	40
30–39	59	43	37	52
20–29	31	18	15	48
10–19	15	3	9	17
0–9	6	1	6	5
Mean scores	60.7	58.8	55.8	52.5

The word classification test included one-fifth of the first grade words in the basal reading system; since scores were corrected for chance, it is assumed that children whose scores on the word classification test were below 20 had a sight vocabulary of less than 100 words. If this is taken as

a criterion of reading difficulty as this level, the total number of children who showed reading disabilities at the end of the year was 62 out of 1,522, or 4 per cent. If scores from 0–9 words on the word classification test indicate "non-readers", or children with scores of less than 50 words at the end of the year, we find 18 "non-readers" among the 1,522 children.

Comparative Achievements for Community A

Community A provided an opportunity for comparing the achievements of the experimental year with the first-grade achievements of the previous year. *Metropolitan Reading Tests* were given in October to all children entering second grade. Since there was less than 2 per cent retardation in either year, the figures are indicative of the achievements in the experimental year, 1956, and the prior year, 1955.

TABLE XXXVI. Beginning Second-Grade Reading Scores in Community A

Reading Grade	Experimental		Prior Year	
	N	%	N	%
above 3.0	150	24.4	94	16.6
2.5–2.9	131	21.3	102	18.8
2.0–2.4	211	34.4	210	37.1
1.5–1.9	109	17.7	125	22.1
below 1.5	14	2.3	35	6.2
Total	615		566	
Mean reading grade	2.5		2.3	

The comparisons are interesting at both ends of the distributions. A much higher proportion of the children read above third-grade level; a much lower proportion read below 1.5.

Other Findings in the June Study

More complete information in relation to June test findings may be found in the following study: Gavel, Sylvia R., *Patterns of Growth in First-Grade Reading*; Ed.D. thesis, Boston University, 1957. Copies on microfilm may be obtained from: University Microfilms, Ann Arbor, Michigan.

CONCLUSIONS

A study of the relationships between June reading achievements of 1,506 first-grade children and their September and February test scores indicate the following:

1. September tests which best predict June reading achievement are: writing letters dictated, naming letters, identifying letters named, and learning rate for words.
2. September tests which correlate less than .50 with June reading achievement are the following: intelligence quotient, mental age, sounding letters, identifying words shown, identifying sounds in words, matching letters. Chronological age correlates negatively with June achievement, −.06.

3. February tests which predict June reading achievement with correlations higher than .60 are reading achievement, hearing sounds in words, applied phonics, sounding lower-case letters.
4. Letter knowledge tests in February show such high scores for most children that they produce low correlations with June reading achievement.

The effect of the reading program which adapted instruction to the individual needs of children is shown by the following June achievements:

1. The average reading achievement was above the national norms in all communities, with mean scores of 2.6, 2.5, 2.3, and 2.1. The per cents of children achieving above second-grade norms in these communities were: 77.7, 76.5, 72.4, and 58.0.
2. Elimination of needless reading readiness practice for the pupils with high September learning rates and background abilities produced an unusual proportion of children reading above third-grade level; for the different communities the per cents reading above this level were 30.3, 28.6, 18.5, and 16.2.
3. There were few "non-readers" at the end of the year. There were 18 children who had a sight vocabulary of less than 50 words; this is 1 per cent of the population. Four per cent, or 62 children had a sight vocabulary of less than 100 words.
4. The community which provided no local supervision of first-grade teachers in the study had the lowest reading achievement in June. Supervision which assists in the preparation and exchange of teacher-built materials is apparently essential to the success of the program.

Chapter V

EARLY INSTRUCTION IN LETTER NAMES AND SOUNDS AS RELATED TO SUCCESS IN BEGINNING READING

ELEANOR B. LINEHAN

Basal reading systems vary in emphasis and time of teaching letter names and sounds in first-grade reading. Few insist on early teaching of letter names and sounds; most follow the practice of starting reading instruction with word presentation, with letters and sounds being taught later in the year. Often the teaching of letter names and sounds is incidental with no attempt at mastery during the year. It was the purpose of this study to evaluate the effect of a program of systematic teaching of letter names and sounds upon first-grade reading achievement.

Methods and Materials of Instruction

The twelve experimental and twelve control classrooms all used the Scott, Foresman basal readers for first grade. The control group teachers were to follow the manuals of the basal readers to the best of their ability. The chief differences in the experimental and control programs were as follows:

1. Basal reader introduction:
   Control: Started immediately with lessons prescribed by the manual.
   Experimental: Delayed until letter names were mastered.
2. Progress rate provision:
   Control: Related to speed of acquiring a sight vocabulary.
   Experimental: Related to progress in word analysis abilities.
3. Word recognition teaching:
   Control: Major emphasis on establishing a sight vocabulary.
   Experimental: Sight vocabulary instruction given, but incidental until letter names and ear-training were fairly well established.
4. Letter names:
   Control: Taught incidentally throughout the year.
   Experimental: Systematic teaching during the first three months.
5. Ability to identify sounds in spoken words (ear-training):
   Control: Some teaching of consonant sounds in words.
   Experimental: Early systematic teaching of ear-training.
6. Phonics:
   Control: Incidental teaching of sounds of letters throughout the year.
   Experimental: Sounds of letters and applied phonics taught when letter names and ear-training were well established.

The psychological set was the same for both groups; it was explained to all teachers at a preliminary meeting that the relative merits of the two programs was not known, that there were competent reading experts supporting each program. They were told that valid evidence on the question of merit of the two programs could be obtained only by following

the prescribed programs closely. All knew that the reading program was to be closely supervised and measured. Teachers were invited to express a preference for control or experimental groups; where the preference was strong, it was honored in making the assignments of teachers.

The experimental program required teacher preparation of much of the instructional material. The teaching of letter names began with capital letters in meaningful situations, followed by the teaching of lower-case letters. A great many games and devices were made by the teachers, and these were duplicated and exchanged. Ear-training was presented through the use of lessons from *Building Word Power*, through the use of picture charts containing words with similar beginning or ending sounds, through techniques of noticing the speech organs when words contained certain sounds. Successful devices for ear-training were exchanged among teachers. The program in phonics was started as soon as groups of children had a reasonable mastery of letter names and were able to identify sounds in spoken words. The phonics program emphasized sounds accompanying printed words, but practice was given on sounding letters separately. In addition, there was much practice in applied phonics which emphasized word meaning. For example, the words *call*, *fall*, and *tall* were presented; children were told that every word said *all* at the end, then were asked, "Which word describes a big man?" "Which does your mother do when she wants you to come?" These exercises were also built and exchanged by teachers. A fuller description of the lessons used in the experimental program may be found in *Improving Reading Instruction*.[1]

Grouping for instruction in the experimental group was based upon September tests of knowledge of letter names and the ability to identify sounds in spoken words. This correlated well with learning rate for words. The children were taught a sight vocabulary from the beginning, but this was incidental with the emphasis being placed on growth in letter names and sounds. It should be noted that much of the instruction in letter names and sounds included the presentation of whole words which were meaningful to the children.

The Testing Program

The testing program was essentially the same as that described in the previous chapters, with tests being given in September, November, February, and June. Individual tests of oral reading and applied phonics were given in June. The oral reading test was especially important to provide an additional basis for comparison of the relative sizes of sight vocabularies.

Matching Experimental and Control Groups

Twelve experimental classrooms were paired with twelve control classrooms by selecting classrooms in the same schools in which children were distributed randomly. The results of the matching is found in Table XXXVII. There were 314 children in the experimental group, 300 in the control group.

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[1]Durrell, Donald D., *Improving Reading Instruction*, World Book Company, 1956. Teaching letter names and ear training is described in Chapter 4; applied phonics in Chapter 11, especially pages 238–240, 245–247.

TABLE XXXVII. September Data for Matched Experimental and Control Groups

	Means		Standard Deviations		Difference of Means	C. R.
	Exp.	*Control*	*Exp.*	*Control*		
Mental age (months)	81.2	82.4	6.35	7.21	1.21*	2.24
Learning rate	3.5	4.4	1.50	2.60	.90*	5.29
Naming capital letters	10.7	10.8	8.85	8.49	.12*	.17
Naming lower-case letters	7.6	7.9	7.40	7.04	.28*	.49
Identifying capitals named	15.8	16.2	7.76	7.59	.35*	.57
Writing letters named	9.2	9.0	8.10	7.30	.15	.25
Hearing sounds in words	33.0	31.4	23.85	23.55	1.64	.85
Giving sounds of capitals	2.0	2.2	5.37	5.22	.11*	.19
Giving sounds of lower case	2.0	1.8	4.35	3.39	.20	1.05
Identifying capitals shown	22.9	23.5	4.25	3.42	.53*	1.71
Identifying lower-case shown	21.9	22.4	4.14	3.27	.50*	1.67
Identifying words shown	10.9	12.0	4.44	4.20	1.05*	3.00
Matching capitals	25.1	25.4	2.75	2.37	.29*	1.19
Matching lower-case letters	24.4	24.7	1.99	1.70	.31*	1.21

*Indicates a difference of means favoring the control group.

Despite the random grouping of pupils, the control group was somewhat better than the experimental group on eleven out of fourteen measures. Three measures showed critical ratios above 2.0; mental age, learning rate, and identifying lower-case letters shown. On the measures of letter names and sounds, the differences were very slight. Standard deviations showed similar distribution for the experimental and control groups.

November Measures

Since the experimental factor in the study is the early teaching of letter names and sounds, the November tests were of high importance in determining whether the conditions of the experiment were being met. November tests for the 314 experimental and 300 control children are shown in Table XXXVIII.

TABLE XXXVIII. November Tests of Letter Knowledge in the Experimental and Control Groups

	Means		Standard Deviations		Difference of Means	C. R.
	Exp.	*Control*	*Exp.*	*Control*		
Identifying capitals named	22.7	20.2	5.43	6.77	2.46	4.82
Identifying lower case named	19.4	15.6	5.85	6.78	3.90	7.36
Writing letters dictated	18.0	12.7	8.46	8.04	5.28	8.25
Hearing sounds in words	17.9	14.4	7.71	5.52	3.47	6.20

The program of early teaching of letter names and sounds proved effective by November tests. Both groups made substantial gains over September scores, but there were significant differences favoring the experimental group in all tests.

February Achievements of Experimental and Control Groups

Tests were given in February to the 314 experimental and 300 control pupils to discover any differences in reading achievement and to see if letter perception scores were being maintained.

TABLE XXXIX. February Achievements of Experimental and Control Groups

	Means		Standard Deviations		Difference of Means	C. R.
	Exp.	*Control*	*Exp.*	*Control*		
Detroit Word Recognition	8.7	6.5	7.28	5.58	2.14	3.81
Oral reading test	74.3	68.1	37.50	30.90	6.20	2.14
Applied phonics	10.6	6.1	8.25	6.96	4.41	6.68
Hearing sounds in words	37.8	32.8	12.15	12.05	5.02	4.73
Naming capital letters	23.9	20.6	3.90	6.84	3.34	6.96
Naming lower-case letters	23.4	21.4	1.34	5.13	1.92	6.00
Writing letters dictated	22.5	19.4	8.04	7.17	3.12	4.80
Giving sounds of letters	16.9	12.3	7.38	7.68	4.66	7.28
Giving sounds of blends	4.5	1.4	6.24	4.07	3.03	6.76

Despite the lack of concentration on word recognition, the experimental group made higher scores in word recognition and oral reading in February than those made by the control group. In all of the tests of letter knowledge, the experimental group made significantly higher scores than did the control group.

June Achievements of the Experimental and Control Groups

June achievements of the children in the twelve experimental and twelve control classrooms are shown in Table XL.

TABLE XL. June Achievements of Experimental and Control Groups

	Means		Standard Deviations		Difference of Means	C. R.
	Exp.	*Control*	*Exp.*	*Control*		
Oral reading test	102.3	79.9	48.10	44.62	22.39	5.82
Silent reading	68.5	65.3	28.60	22.50	3.20	1.49
Word classification	56.8	53.2	22.50	19.00	3.60	2.08
Paragraph meaning	12.4	10.3	6.39	7.05	2.13	3.80
Detroit Word Recognition	23.3	22.0	9.65	9.05	1.23	1.58
Applied phonics	16.9	13.7	7.38	7.79	3.17	5.05
Hearing sounds in words	46.7	44.0	13.25	11.50	2.64	2.56
Giving sounds of letters	21.3	17.7	4.66	5.94	3.55	8.07

In all tests of reading achievement, the experimental group excelled the control group in June; statistically significant differences were found for oral reading and for paragraph meaning. In measures of phonic ability, the experimental group was significantly superior to the control group.

June tests of letter knowledge, not reported here, showed that while the experimental group was still ahead of the control group, the latter children were approaching fairly complete letter knowledge as indicated by writing letters, naming letters, and identifying letters named.

Summary

An experimental group of 314 pupils in twelve classrooms was paired with a control group of 300 children in twelve classrooms in the same schools. On September tests the control pupils were higher than the experimental pupils in mental age, learning rate, and nine of twelve tests of letter knowledge. Only the difference in learning rate was statistically significant.

The experimental group followed a program of systematic presentation of letter knowledge and phonics development with an incidental program of word recognition; the control group used systematic presentation of word recognition with an incidental program of letter and phonics development.

February tests showed statistically significant differences favoring the experimental group in all tests: oral reading, silent reading, applied phonics, hearing sounds in words, and all tests of letter knowledge. June achievements were also in favor of the experimental group, with statistically significant differences in oral reading and paragraph meaning; smaller differences were found in word classification, silent reading, and scores on the *Detroit Word Recognition Test.* The experimental group was significantly superior in all tests of phonic ability.

Other Findings

More complete information on this experimental study may be found in: Linehan, Eleanor B., *Early Instruction in Letter Names and Sounds as Related to Success in Beginning Reading.* Boston University Ed.D. thesis, 1957. Copies on microfilm may be obtained from: University Microfilms, Ann Arbor, Michigan.

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